

## **Abstract of the Disclosure**

A radio frequency (RF) driven plasma ion source has an external RF antenna, i.e. the RF antenna is positioned outside the plasma generating chamber rather than inside. The RF antenna is typically formed of a small diameter metal tube coated with an insulator. A flange is used to mount the external RF antenna to the ion source. The RF antenna tubing is wound around the flange to form a coil. The flange is formed of a material, e.g. quartz, that is essentially transparent to the RF waves. The flange is attached to and forms a part of the plasma source chamber so that the RF waves emitted by the RF antenna enter into the inside of the plasma chamber and ionize a gas contained therein. The plasma ion source is typically a multi-cusp ion source. A converter can be included in the ion source to produce negative ions.